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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT,
No. 87,
For the Week ending September 1, 1877.

HOW SHALL RAILWAY WORKMEN LIVE?

According to the last census the total number of railway employees exclusive of clerks, in this country was, in 1870, 154,027. During the period which has elapsed since the enumeration, our railway mileage has increased from nearly 45,000 to 73,508 miles. Allowing for a proportionate increase in the number of employees, as well as reductions in working force due to economical reasons, it is probably safe to estimate that the railroad workmen of the United States number about 200,000 souls. From the statistical tables given in Poor's "Manual of the Railroads of the United States for 1877-8," it appears that while the gross earnings of the roads have fallen off nearly six million dollars, the net earnings have increased nearly by a million, and this is ascribed chiefly to the great economies practised in conducting the operations of the lines. In furtherance of this system of economy there have been, as our readers are aware, reductions in the wages paid railroad employees. These reductions have been in many cases claimed by the persons affected to render the returns for their labor inadequate for a living support; and accordingly the strike, the usual coercive measure adopted by employees under such circumstances, was resorted to, and characterized unfortunately by acts of lawlessness which rendered the question of restoring the public peace far paramount to any of the other issues involved. When such a course is resorted to, past experience has abundantly proved that failure is the rule. The recent difficulty has shown itself to be no exception, and the contending parties stand to-day in practically the same position as to their causes of dispute as they did prior to the outbreak.

There are certain facts which we believe do not admit of argument which should here be postulated, namely, that in this country at the present time the supply of working men is in excess of the demand, that a railway company, or any other employer, is under no obligation to furnish living incomes as such, and that it has a right to regulate its own rates of payment in accordance with its own best interests. While such is the case, it is obvious that coercive measures to compel an employer to raise wages must prove futile. Until, therefore, through the natural working of the laws of supply and demand some condition of affairs more favorable to the working classes shall come into existence, the problem is not how to force employers to improve matters by increasing the revenue of the working men, but how to do so by enabling the working man to obtain the necessities of living out of the means which he can earn. This we take to be the question of all others which is now pressing for solution with reference to the present labor and capital antagonism.

We find in the New York *Times* a communication, very intelligently written by the wife of a working man, in which she sums up the actual least cost of supporting her family, which includes her husband, self, and five children, the latter under nine years of age. As a matter of statistical information this schedule is of exceptional value. It is as follows:

WEEKLY.		DAILY.	
Rent	$2 00	1 quart milk, 6c	$ 42
1 barrel wood	25	2 quarts potatoes, 6c	42
2 pails coal	16	2 8-cent loaves	1 12
Burial society	22	1½ pounds meat, 20c	1 40
Oatmeal	14	Salt	2
2 pounds butter	60	Pepper	2
3½ pounds sugar	40	Mustard	2
Half gallon oil	9	Matches	1
2 cakes soap	14	Starch	3
1 pound soda	3	Bluing	1
Half pound tea	25		
Newspapers	12	Total	$3 47
Shaving	10		4 50
Total	$4 50	Total	$7 97

Here is 97 cents more than the dollar a day wages which our contemporary's contributor says she undertook to live upon for some time, and failed. Now, the above are retail prices, and the commodities are probably purchased of small dealers, so that the goods have been numerously handled, and repeated profits thus added. It has been determined by Professor Fawcett, the well known English political economist, that the loss incurred by average working men, on account of their articles passing through the hands of shopkeepers, is about 20 per cent. Deducting the $2 rent, and taking off this proportion from the remainder, we have a balance of $4.78 as the actual cost of the food, etc., less shopkeepers' profits. Now the rent quoted amounts to $104 per year, or about one fourth of the total expenses. This is a large proportion to pay for rent. In England the same item amounts rarely to more than one eighth of the amount of wages earned. We find it stated that the general 3 shillings and 6 pence (87 cents) per week dwelling is largely used by families earning 30 shillings ($7.50) per week, which last is about the same as that earned in the case under consideration.

It will be obvious that the problem before us is how to reduce the cost of living to the working man, and of this we may learn something from what has been done in England. There societies for this very object have for some time been in successful existence. The Permanent Building Society, of Leeds, has furnished healthy tenements at very low rates to about 200 families. In Burnley, another society has assisted hundreds by advancing money on mortgages paid by easy installments. The arrangement is such that the workman pays a small subscription to the society until enough has been contributed to warrant the association buying and conveying to him the house in which he lives. The same has been done by large employers, like the Messrs. Ashworth and the late Sir Titus Salt; and in London there is a large corporation called the Industrial Dwellings Company, which now rents 2,799 tenements, capable of accommodating 12,115 people. Not only has this enterprise greatly benefitted the working men, but as an investment, in five years, it has earned large surplus profits after paying 5 per cent dividends. The rent averages about 50 cents a week for an apartment furnished with every modern convenience.

Not only might similar societies be established here: but others might be started for supplying working men with the necessaries of life at prices certainly *minus* the retail profits already noted. These last could evidently be begun on a small scale and with little capital. The railroad companies themselves might establish stores for their men, or benevolent societies such as the Young Men's Christian Association would here find an excellent object for their philanthropic efforts. A few persons in well-to-do circumstances in every railroad town could easily subsidize such sources of supply, and eventually change them into co-operative establishments as the men learned to live on their reduced incomes. Nor need the work of the benevolent end here. Some of the railroad companies now, in order to prevent their men joining unions, afford them all the advantages of life insurances, etc., which the unions offer. Outside societies for this purpose might also be organized. We have benevolent societies for the care of children, for the aged, and for sailors—why not also for railroad employees whose life presents many analogies to that of the sea-faring man.

It may be said that in dealing with so great a class the laws of demand and supply, inexorable as they are, should only be considered, and that philanthropy has here no place. We think otherwise. The life of a railway employee has its duties and dangers which cannot, morally viewed at least, find compensation in the market rate of wages. Here is an immense number of men who in their daily work expose their lives to constant peril, greater, says an eminent statistician, than that of the soldier in battle. They are subject to peculiar and painful diseases, produced by the conditions under which they work; they are subjected to every hardship of inclement weather and of absence from home, and through all they are obliged to keep tireless watch. Their record is one of unflinching devotion to duty, even in the face of imminent death, and to their hands are committed the safety of enormous wealth, vast interests, and human life. The benevolence of the community may safely rest upon such a showing. Mr. W. H. Vanderbilt has already emphasized this fact by his gift of $100,000 to the employees of the New York Central and Hudson River Railroad, over which he presides. This is one good example, and we hope to see it imitated. The workmen, however, do not ask alms—true charity in their case is to show them how to live on what they can honorably earn. And it is by such action as this that strikes may be caused to become forgotten weapons.

EARLY CONNECTICUT MANUFACTURES.

Very few of our readers are aware that patents, or exclusive privileges to manufacture certain articles, were granted by some of the colonial governments, but such is the fact. The General Assembly of Connecticut took the lead in this encouragement of the growth of infant manufactures, and it is therefore very probable that this is the reason why so much manufacturing is carried on within her borders, and so many of her sons are engaged in the same line in other States.

In addition to the special grants hereafter given, the Assembly passed at least three general acts for the encouragement of discoveries and inventions; one of which, passed in 1663, related solely to the discovery of mines; a second, dated 1672, was enacted for the same purpose, but it had an additional section which forbid the passing of monopolies, "except for such new inventions as shall be judged profitable to the country, and for such time as the General Court shall deem meet;" and a third act, passed in 1715, enacted "That if any person or persons shall set themselves on work to discover any commodities that may be of use for the country, for the bringing in a supply of goods from foreign parts, that is not as yet of use among us, he that discovers it shall have due encouragement granted to him and the adventurers therein" (Statutes of 1715, p. 5).

Many of the special privileges granted will be found to be more of the character of monopolies, or bounties for the introduction of new trades and manufactures, rather than patents for new inventions, but the latter are not wanting.

The first individual or private grant that we find is that issued to John Elliot, in 1708, which gave him the exclusive right for ten years of manufacturing pitch, provided he started the manufactory within two years.

In 1717, E. Hinman obtained a grant giving him the exclusive right to make molasses from corn stalks for ten years—a right which he probably would have found no one to interfere with if he had not had the grant.

A third grant, issued in 1718, gave the exclusive privilege for 20 years of setting up oil mills for the manufacture of linseed oil, to Messrs. Prout, Mansfield & Atwater.

The next patent appears to be one issued to Ebenezer Fitch, in May, 1728, which granted to said Fitch and Co., the exclusive right for 15 years of erecting slitting mills, "to slit and draw out iron rods for nails, and other artificers in iron."

In the same month a patent was granted to Samuel Higley and Jos. Dewey, giving them for ten years "the sole practicing of the said art of steel making," which "said art" seems to have been a method discovered by them of converting iron into steel by the cementation process.

Another patent was issued for a similar process to Messrs. Fitch, Wyllys & Walker, in 1740, for fifteen years, on condition that they should begin operating within two years.

This proviso, however, they failed to keep, owing to the death of the capitalist they had engaged to help them to the necessary funds; and in consequence, at the end of three years, we find them making an application for the renewal of their grant, which was done and, as other documents show, they succeeded in making good steel in considerable quantities.

In May, 1741, the exclusive right of making potash for 20 years was given to Messrs. Willard, Hamlin, Wetmore, Chauncey & Fairchild.

In 1746, John and Stephen Jerom obtained the exclusive right for 14 years of making salt by evaporating sea water; and three years after procured a loan from the Assembly of £1,000, for two years, to enable them to continue their operations, as they had not yet succeeded commercially for want of sufficient capital.

The exclusive privilege of making glass for 20 years was given, in 1747, to Thomas Darling, on condition that he and his assignees should set up suitable works and prepare a stock of materials within four years, with a further proviso that they should make at least 500 feet of good window glass every year thereafter.

It would appear that Darling did not succeed in introducing the manufacture of glass, for in 1779 we find a grant giving "during the pleasure of the Assembly," to Messrs. Hubbard, Mosely, Little & Latimer, a similar exclusive privilege, except that only one year was given in which to commence operations. Before this year had expired, however, a memorial was filed by Mosely and Little, stating that Hubbard and Latimer had withdrawn on account of the great expense and risk, and asking that they (Mosely and Little) may be allowed to raise £2,000 by a lottery. This lottery privilege does not appear to have been granted, but instead an exclusive right for 15 years was given on the same conditions as the last.

This project would also appear to have failed, for we find another exclusive grant, three years after, to Pitkin, Bishop & Pitkin, for the term of 25 years, on condition that they began manufacturing within three years. These parties also seem to have met with little or no success, for we find a memorial from them complaining of the discouragements they had met with in their efforts, and asking that a lottery may be granted to them for the purpose of raising £400, which was allowed.

In 1753 a grant of the exclusive privilege, for 15 years, of setting up "a new invented water machine for the dressing of flax," was given to Jabez Hamlin and Elihu Chauncey.

A bounty of 2*d.* per quire of writing paper and 1*d.* per quire of printing paper or coarser paper, was ordered by the Assembly in 1768 to be paid to C. Leffingwell on all paper made by him; which appears to have been done for one year only, during which he made 4,020 quires of writing paper and 10,600 of inferior quality, after which the bounty was discontinued.

Another document, a memorial from Abel Buell, dated October 8, 1766, states that the writer had been sentenced to imprisonment for life for "altering the bills of public credit," which sentence had been remitted on account of his youth; and after stating that he had discovered a method of grinding and polishing crystals, asks that the privileges which he "had justly lost" might be restored to him, that he might carry on the aforesaid business. On his giving bonds as to future good behavior, this was done.

Three years after we find another petition from the same man stating that he had discovered the art of letter founding, and asking that he be allowed to "raise money by lottery to carry on the same, or in some other way." With the memorial he furnished specimens of his handiwork, which are said by those who have seen them to have been superior to the type of that day and equal to the average of that of a much later date. A committee of the Assembly was ordered to investigate the project, and on their favorable report the treasurer was ordered to loan Buell £100 at at once and another £100 at the end of a year, on condition that he give a bond in £200 that he would pursue said business and would not leave the colony within seven years. It appears, however, that he did not meet with much success, for we find a petition from his wife, dated August 8, 1777, stating that the long absence of her husband made her despair of ever seeing him again, and requesting the Assembly to be allowed to pay £100 in full of all demands against them, which the Assembly accepted.

In 1774, George Phillips applied for and obtained the privilege of refining loaf sugar for ten years, which was to be exclusive, except that the Assembly retained the option of allowing two other refineries to be set up, and during the next two years granted such permits to other parties.

A patent was issued in the same year, granting to John Shipman for 40 years the exclusive privilege of erecting within certain territory his newly invented tide grist mill, on condition that it should be erected within five years.

Under the date of February 3, 1776, we find that the sum of £60 was ordered to be paid David Bushnell, as some encouragement for him to proceed in preparing his machine for blowing-up ships, etc. No particulars of the plans appear on the files, but from other sources we learn that this, "the American Turtle," as it was called, the prototype of the modern torpedo boat, was composed of two shells joined together water-tight, and of sufficient capacity to contain the operator and air enough to support him under water for half an hour. The "turtle" was caused to rise or sink by pumping the water from or allowing it to enter into a chamber beneath him, at the same time lowering or raising an ingot of lead of 200 lbs. weight, which might be made to touch bottom. The propelling force was an oar worked from a compartment in the forepart; and at its stern a magazine of powder was attached, which could be detached and secured to, or sent against another vessel. The magazine was provided with a gun-lock to fire the powder, which was operated by clockwork calculated to run sufficiently long after being set in motion to allow the operator to reach a place of safety previous to explosion. With this apparatus he made an attack on the British ship "Eagle," of 64 guns, in New York harbor, but only succeeded in frightening the crew, although he afterwards succeeded in blowing up a schooner at New London.

In 1778, the Assembly granted permission to two widows named Hannah Watson and Sarah Ledyard, to raise £1,500 by lottery to rebuild a paper mill owned by them, which had been destroyed by fire. From a statement in their memorial, it appears that the Hartford newspapers of that day circulated about 8,000 copies weekly.

In 1783, a patent was granted to Benjamin Hanks for fourteen years for "a clock or machine that winds up itself by help of the air, and will continue to do so without any other aid or assistance until the component parts thereof are destroyed by friction." This was probably a clock provided with a windwheel set in such a position that the heated air escaping from a room would operate the wheel and so keep the clock continually wound. A clock similar to this was patented to Robert Hitchcock, September 10, 1861.

The exclusive right to make snuff was granted to William Pitkin in 1784, for 14 years.

In 1787, an act was passed giving to Samuel Loomis the exclusive right of erecting works for the manufacture of wool, cotton, hemp, flax, and silk, "upon a new constructed plan," on the east side of the Connecticut river, or within ten miles west thereof, for seven years, and an exclusive privilege for seven years longer on any ground within thirty miles of such works.

In addition to the above we find a number of rejected applications for special privileges in manufacturing various articles, from pins to perpetual motions. (The perpetual motion man's memorial was endorsed "Prisoner in jail.") Some of the applicants wanted an exclusive right only; others wanted loans from the Assembly—some with interest and some without; and still others, to enable them to start the manufacture of some article not then made in the colony, petitioned for the privilege of raising stated sums of money, ranging from £100 to £6,000, by means of lotteries—which last appears to have been a favorite mode of "raising the wind" in those days, if we may judge by the number of applications for the privilege.

From another series of documents, too long to give even a synopsis of them here, we find that considerable attention was given to the manufacture of iron, both cast and wrought, and that as far back as 1736 iron works were building in Salisbury, where during the revolutionary war about 60 men were employed in casting cannon alone, to say nothing of other work.

NOTES OF PATENT OFFICE DECISIONS.

PATENTS.

In the recent interference case of Anson *vs.* Woodbury, the Commissioner of Patents has decided that the Patent Office will take judicial notice of matters of public notoriety affecting the right of an applicant to a patent. Anson applied for a patent for the use of a presser bar in a planing machine, but the Commissioner holds that, as a matter of public notoriety, presser bars of the description claimed by Anson have been in public use for upwards of twenty years, in support of which he cites the SCIENTIFIC AMERICAN for July 5, 1873, vol. 29, p. 7; and November 20, 1875, vol. 33, p. 25. He therefore dissolves the interference and rejects Anson's application. The rule is laid down in this case that, on a motion to dissolve the interference on the ground of notorious public use for more than two years prior to the filing of the application for the patent, *ex parte* affidavits made by adverse parties cannot be received to impeach the patentability of the applicant's invention. It is immaterial that such affidavits were not submitted to show any particular instances of use, but rather to show notoriety of use. In admitting and considering such affidavits as evidence, the Patent Office would be adjudicating upon the rights of applicants on testimony not taken in accordance with any requirements of law, and of witnesses which the parties in interest had no opportunity to cross-examine.

A claim for an improvement in ant-guards, consisting of a concave flange, arranged on the leg of a table or other piece of furniture, and coated on the under side with chalk, is decided in the case of Strong *vs.* Cruikshank to be lacking in patentable novelty. The peculiar property possessed by chalk, rendering it an impassable barrier to the march of ants, is well known, and the use of concave flanges on corn-cribs, trees, etc., to prevent the ascent of insects is old in the art. The only novelty that could be claimed, therefore, was the fact that protection was afforded by the flange to the chalk. This is not patentable, since it is but the exercise of simple intelligence to put the chalk on the under side of the flange, where it is best protected from being rubbed off.

On the application for a reissue of letters patent in the case of a machine patent, the model and drawings cannot be amended except each by the other, and the Commissioner cannot go outside of the record to ascertain what was the scope or detail of the original invention. Thus in the case of Stockwell *vs.* Haines, just decided, the Commissioner rejects affidavits offered to prove that a certain pin—not shown in the drawing or specification, although there was a horizontal perforation in the model, in which such pin might be placed—did form a part of the original invention. An invention not set forth in the original specification, nor fully shown in the original drawings, cannot be incorporated on reissue, where its existence depends upon the restoration of a missing element to the model in a particular position, it not appearing that such position is necessarily the only one it can have, and both original specification and drawings failing to indicate its location.

TRADE MARKS.

An application for the registration of an arrangement of a star and crescent as a trade mark for soap was lately filed by Cornwall & Brother. The Examiner of Trade Marks referred them to a registered trade mark consisting of the figure of a star alone, also applied to soap, and contended that the employment of the combined symbol of a star and crescent would be likely to deceive parties desirous of purchasing soap having the brand of the star alone. This decision has just been reversed on appeal.

The fact is referred to that the flags of two nations are distinguished by almost the same difference in symbol as that employed by Cornwall & Brother to distinguish their soap from that made by the owners of the registered trade mark. The flag of Egypt is a crescent on a red ground, and the Turkish man-of-war flag is a crescent and star on the same colored ground, but there is no mistaking one flag for the other by persons of the slightest discernment; and the same may be said when those symbols are applied in a similar way to the soap of two different owners.

The application for the registration of the figure of a "swan" with the words "Our London Swan Gin" as a label is refused to John D. Park. The figure of a swan with some other arbitrary matter had previously been registered by other parties as a trade mark applied to this article. The Commissioner decides that as Park's label includes arbitrary and fanciful words and figures constituting a proper trademark, in addition to matter properly a label, he should first register the fanciful matter as a trademark; but before he could do this, under the circumstances, he must first establish his right to the trademark. This he could do by proof adduced in an interference proceeding, or by an adjudication of a court of competent jurisdiction establishing his title to the same.

MUSCULAR CONTRACTION AND ELECTRICITY.

Muscular contraction is always accompanied with electrical phenomena. The difference of electric force between two points of a muscle undergoes a diminution, which, according to Beunstein, precedes the contraction by $\frac{1}{100}$ of a second. M. De la Roche has recently examined the electrical power of the human heart. The electrodes consisted each of a plate of amalgamated zinc with a pledget of muslin saturated with sulphate of zinc at the lower extremities. These were applied, one with its muslin wad opposite the heart on the left breast, the other on another part of the chest, and connection was made with a capillary electrometer. The mercury column executed a very distinct series of periodic pulsations, synchronic with the pulse. Each pulsation marked the double movement of the heart. The result obtained corresponded to $\frac{1}{1000}$ of a Daniell element.

BOILER TEST CHALLENGE.

To the Editor of the Scientific American:

Being an interested party at the Centennial boiler test, and knowing that the Root boiler is ahead, according to the official report issued by the Director-General, Hon. A. T. Goshorn, and as certain interested parties have put restrictions on the further issuing of the report as officially made, and as Messrs. Babcock & Wilcox are not satisfied with the result, we propose to make an economy test against them at the American Institute this fall, for from one thousand to five thousand dollars a side, each party to select one man and those two to select the third, as judges, they to make all rules and regulations, and their report to be final.

Yours respectfully,

ABENDROTH & ROOT MANUFACTURING COMPANY.

New York, August 16, 1877,

Professor Edward Heis.

The death is announced of Professor Edward Heis, of Munster, one of the most assiduous and accurate observers in those branches of astronomical research which can be cultivated, without any powerful instruments, by means of observations made with the naked eye. He was born in 1806. He made observations of the relative magnitudes of all stars visible to the naked eye, the results of which were embodied in his *Uranometria Nova*, published in 1843, the first really trustworthy Star Atlas. Heis, being gifted with eyes of uncommon acuteness, devoted many years to the observations requisite for a greatly improved edition of this work. Variable stars, shooting stars, auroras, the zodiacal light, the course of the Milky Way, etc., were diligently observed by Heis, and his publications referring to them are of great value.

Seeing the Crescent of Venus.

Mr. D. H. Temple, of San Francisco, Cal., informs us that he saw the crescent of Venus at Mazatlan, Mexico, on the morning of January 24th last. This is considered a very difficult feat of vision.